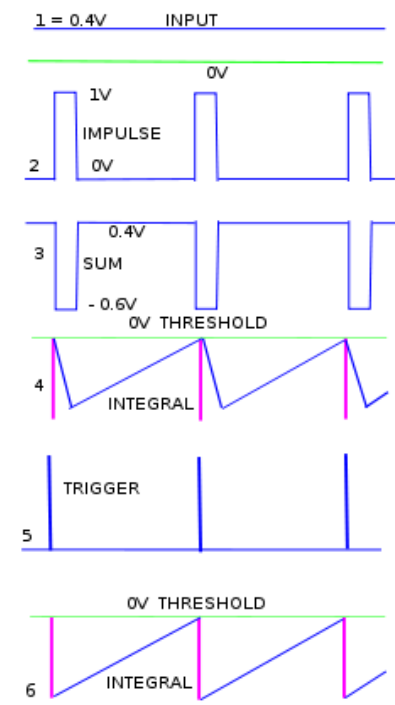
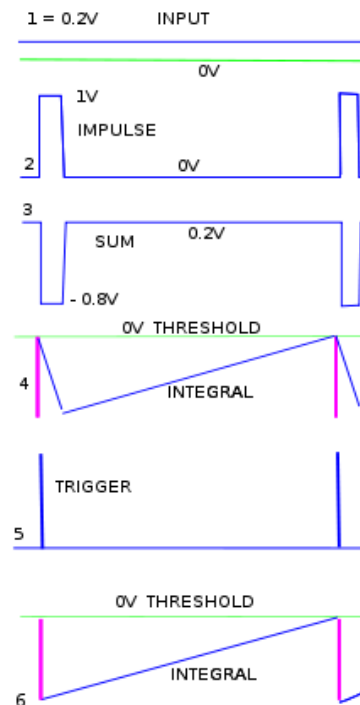
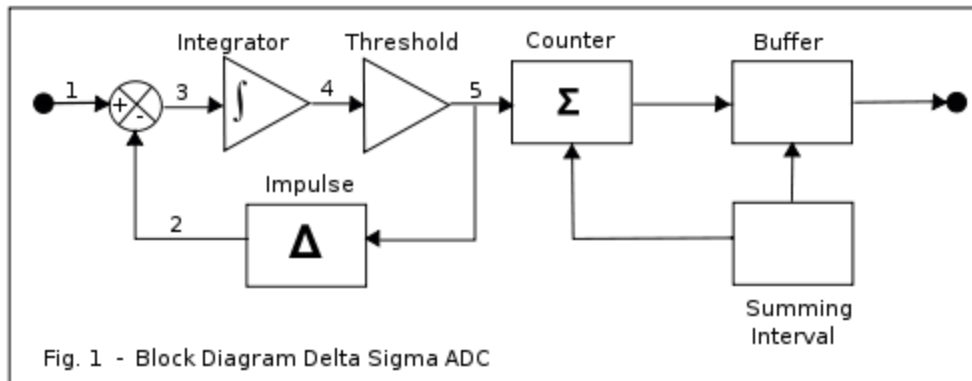
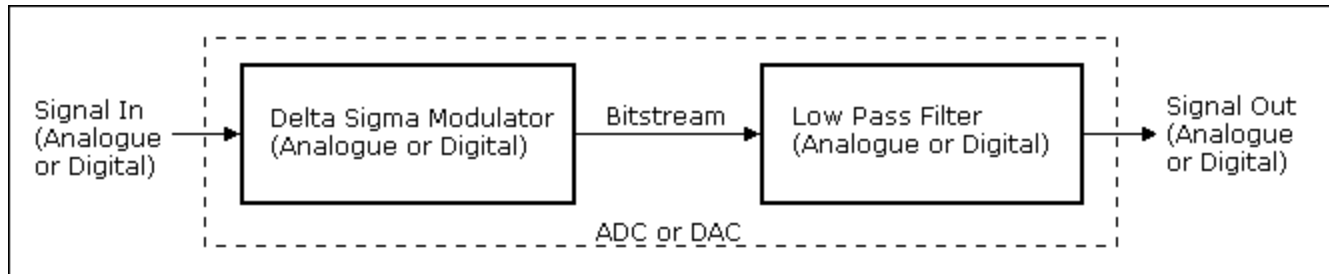
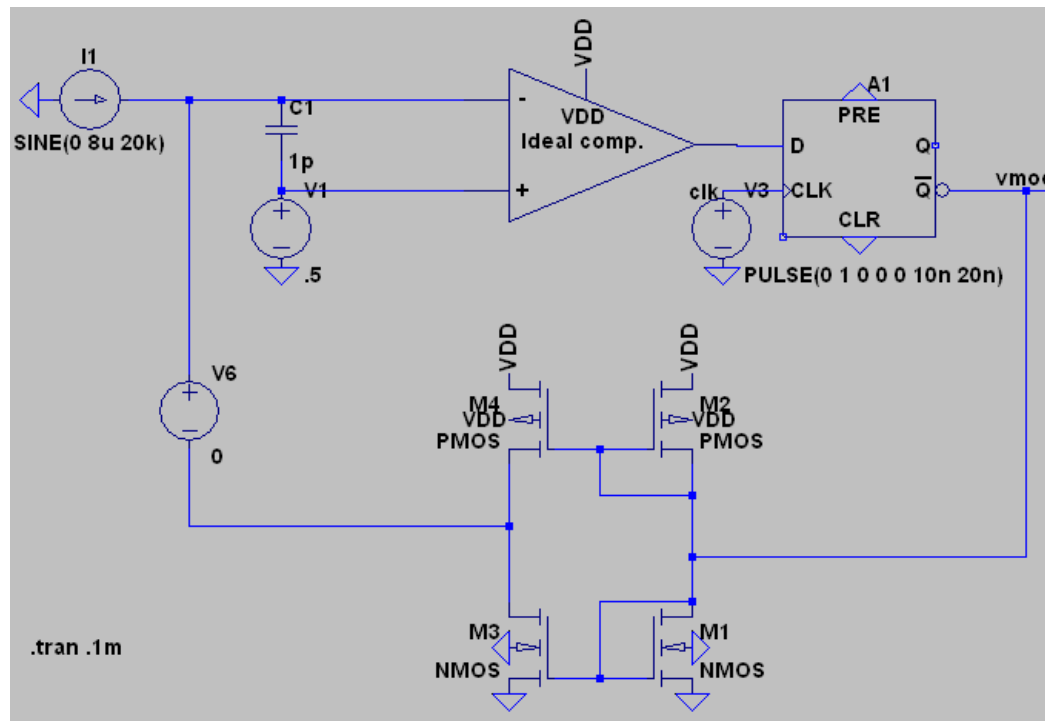
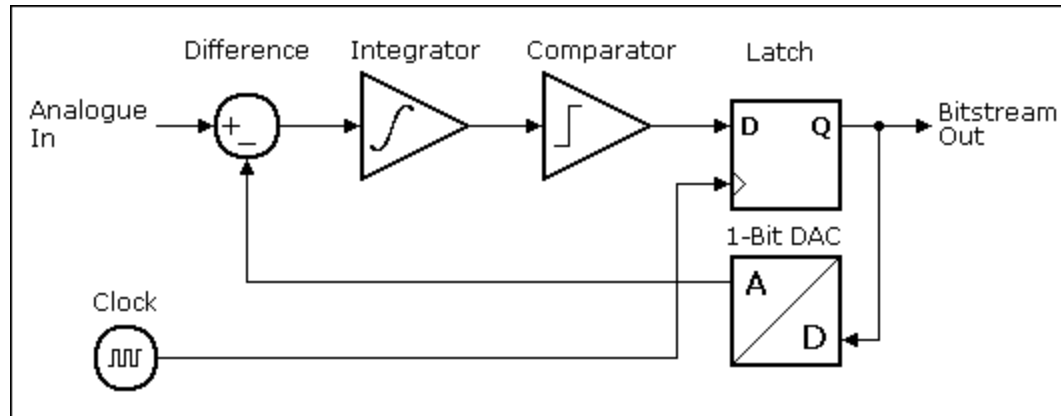


Sigma Delta ADCs

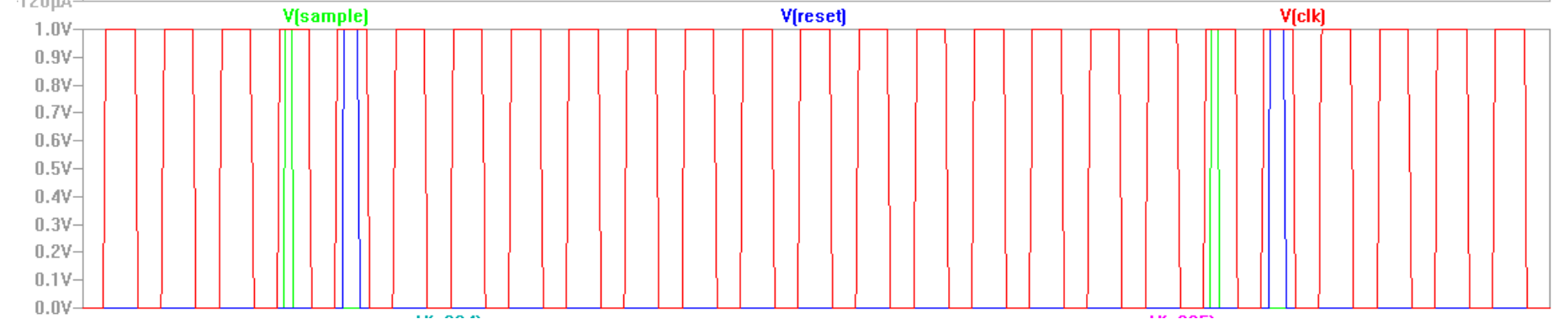
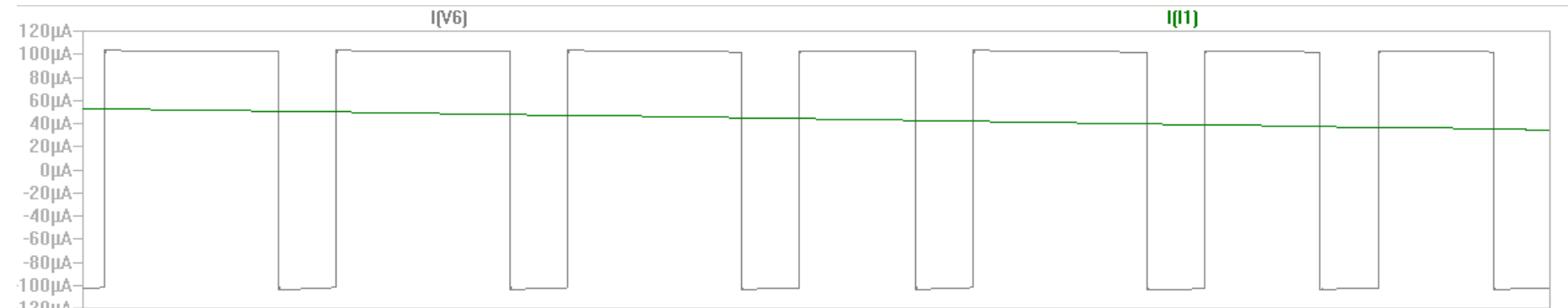
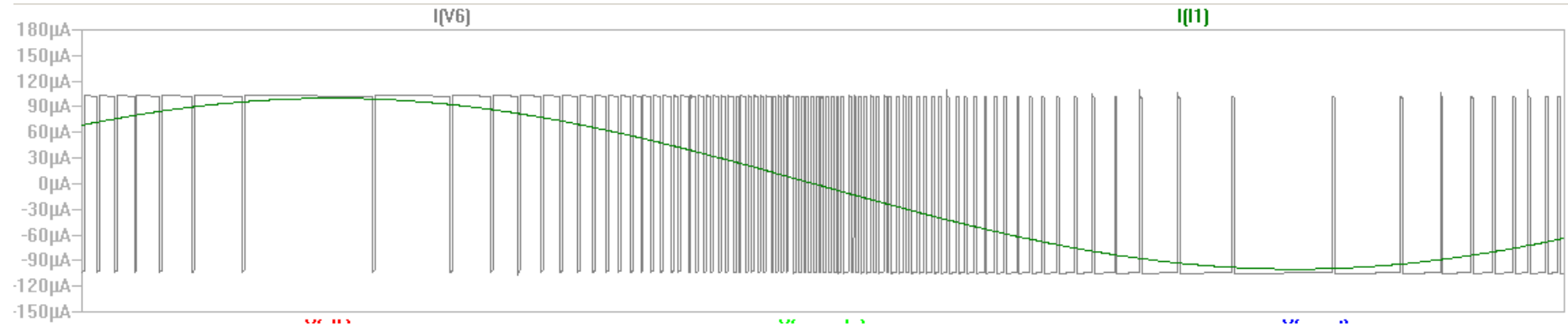
Concept



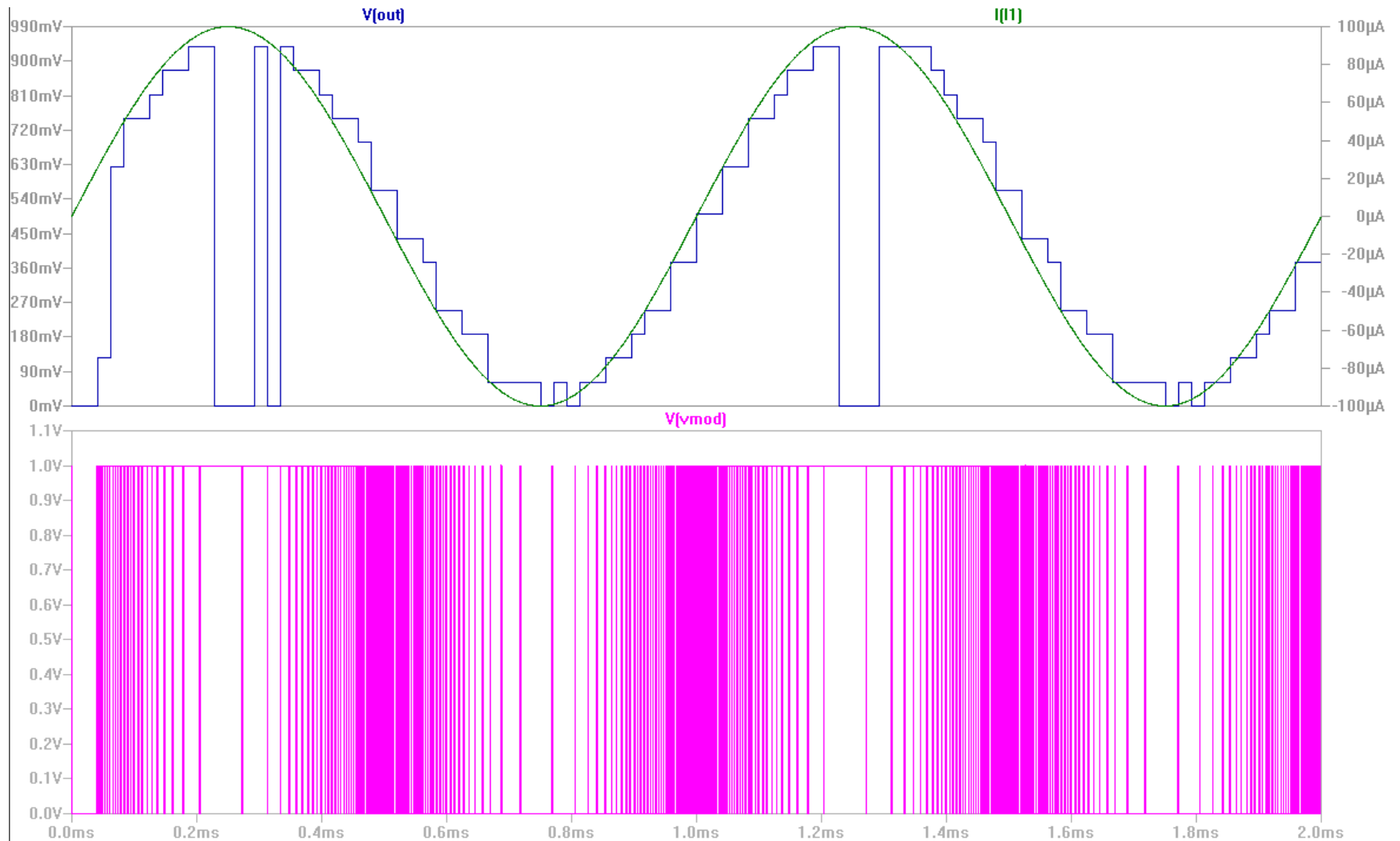
PWM



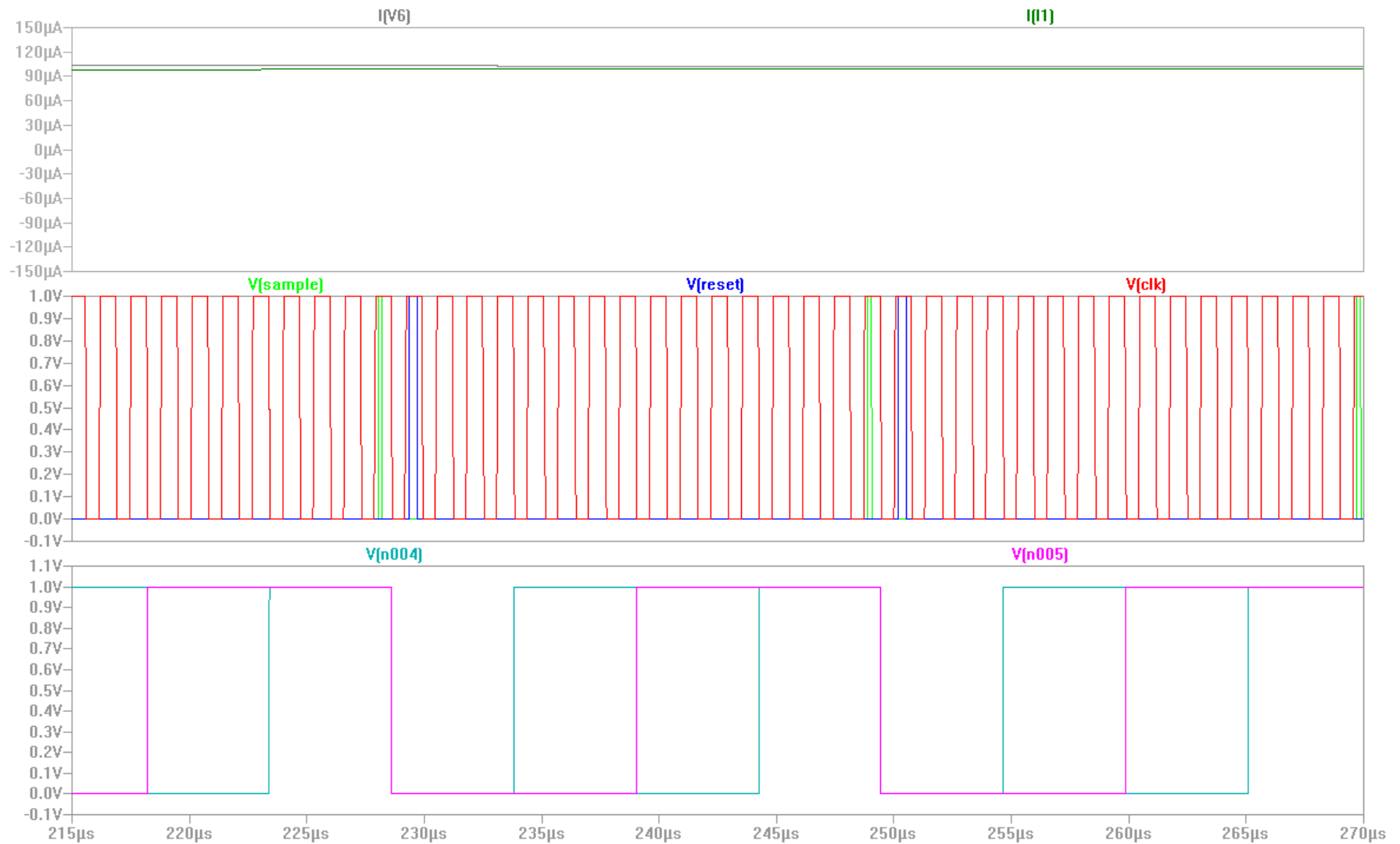
Counting



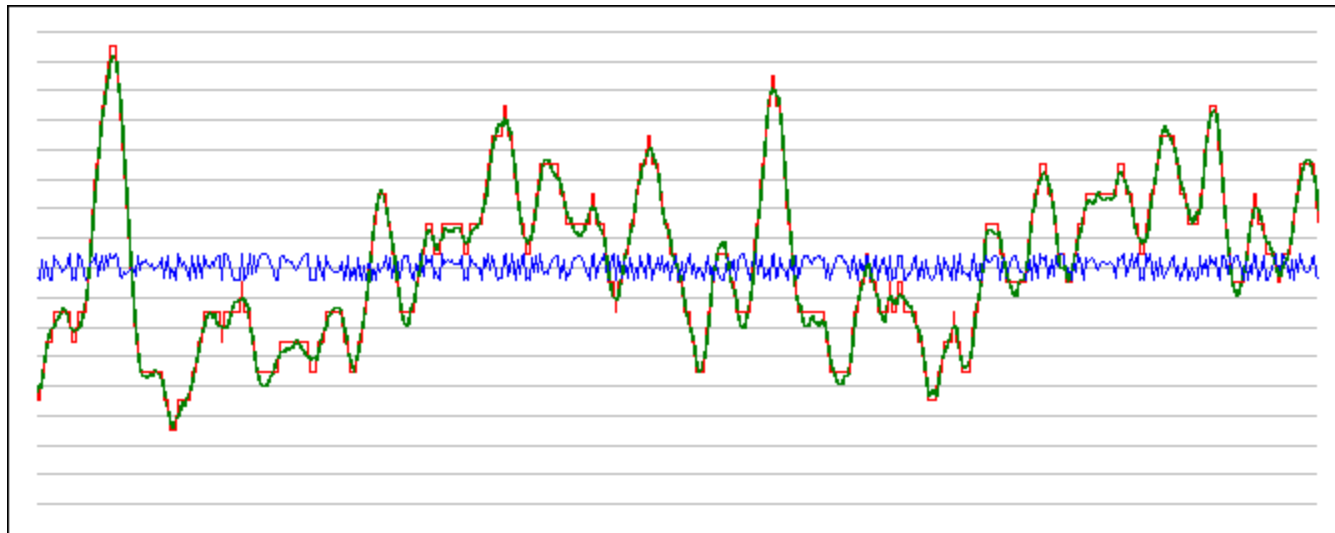
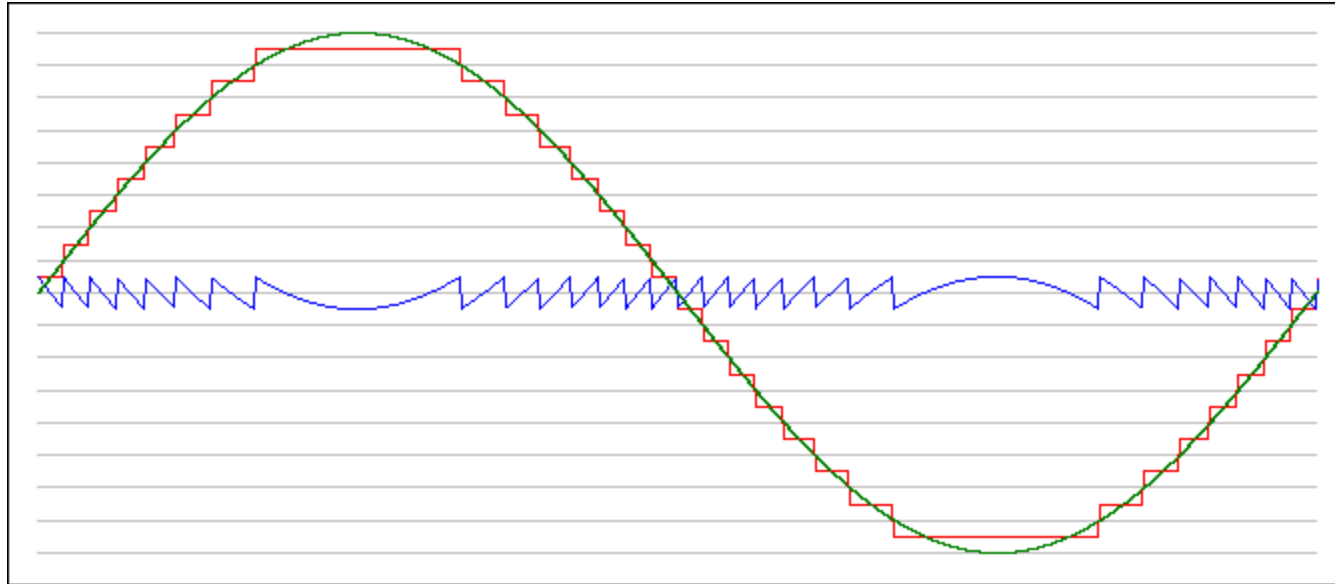
Overflow



Overflow

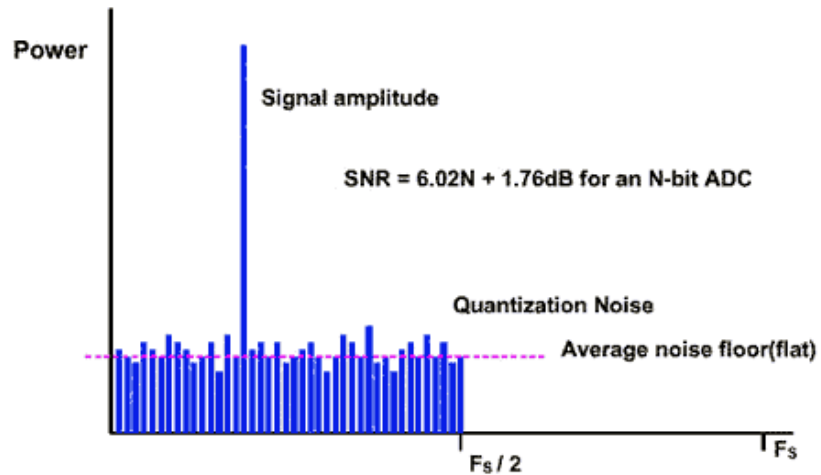


Error and Noise

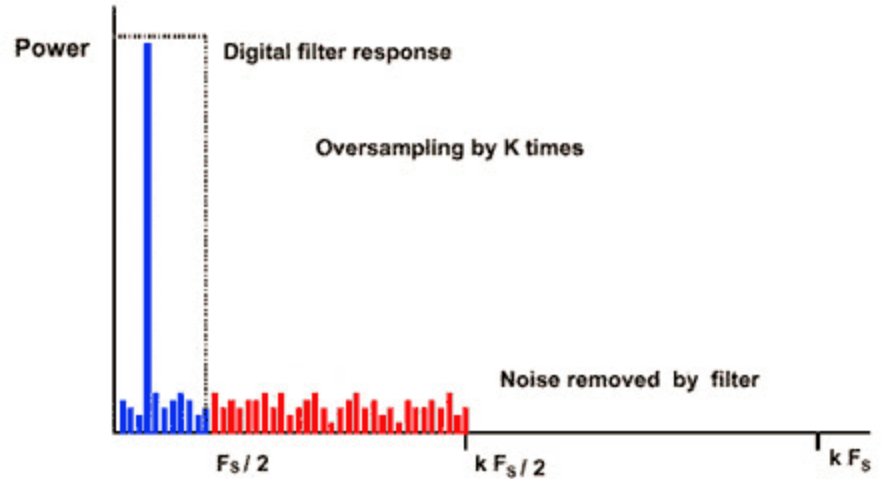


Error and Noise

The Frequency Domain



The Digital Filter



Error and Noise

$$q = \frac{1}{2^{B-1}}$$

Quantization step size

$$N(f) = \frac{q^2}{12f_s} = \frac{2^{-2B}}{3f_s}$$

Relative noise power vs. oversampling

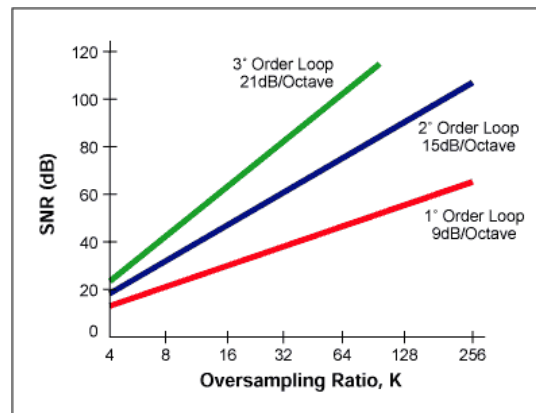
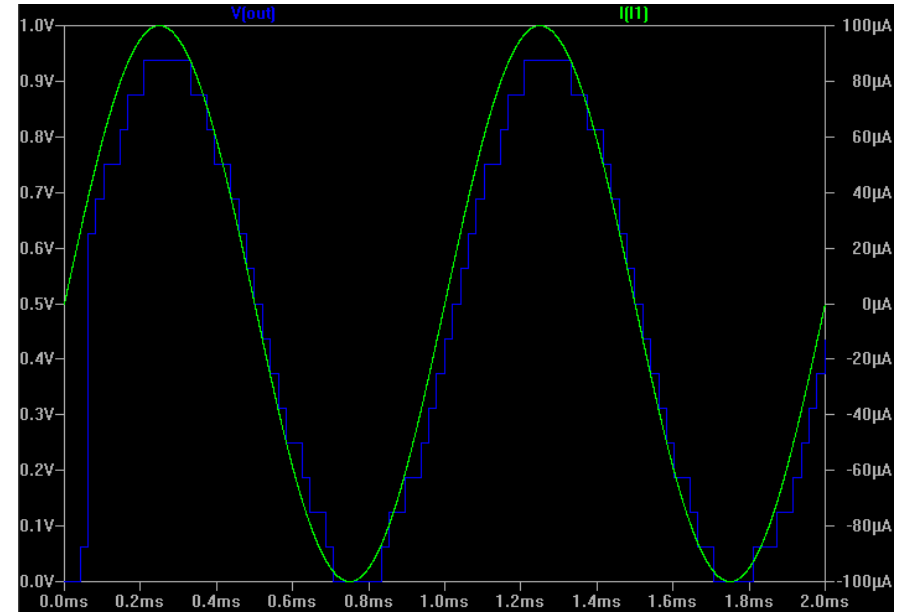
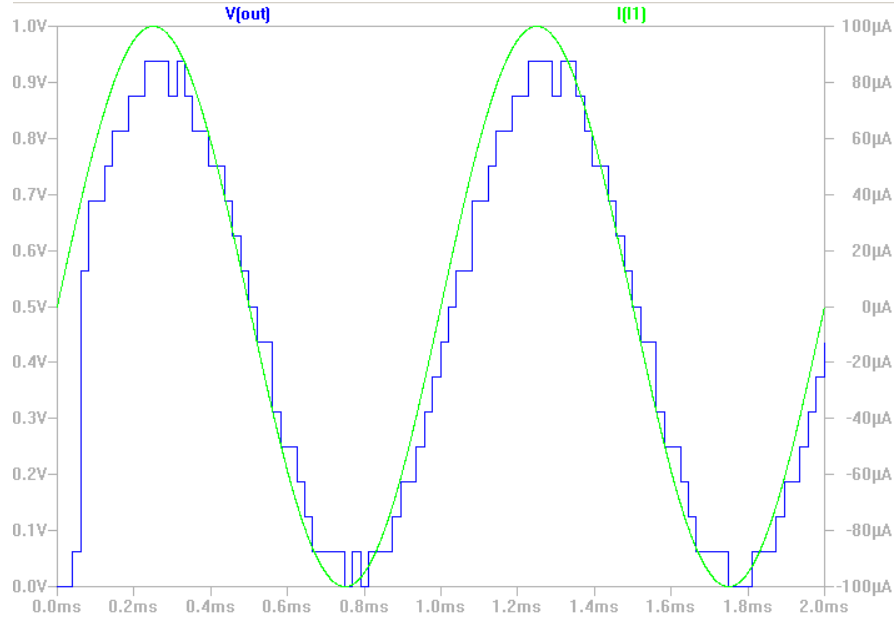
$$N_B = \int_{-f_B}^{f_B} N(f) df = \frac{2f_B}{F_s} \frac{q^2}{12}$$

Percentage of noise in band after filtering

Noise vs. Oversampling

Oversampling = $2F_b \cdot \text{resolution}$

Oversampling = $2F_b \cdot \text{resolution} \cdot 2$



Synthesis

- “Custom block” vs. custom components
- Digital block synthesis:
 - Nangate
 - IP cores